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SCIENCE NEWS LETTER

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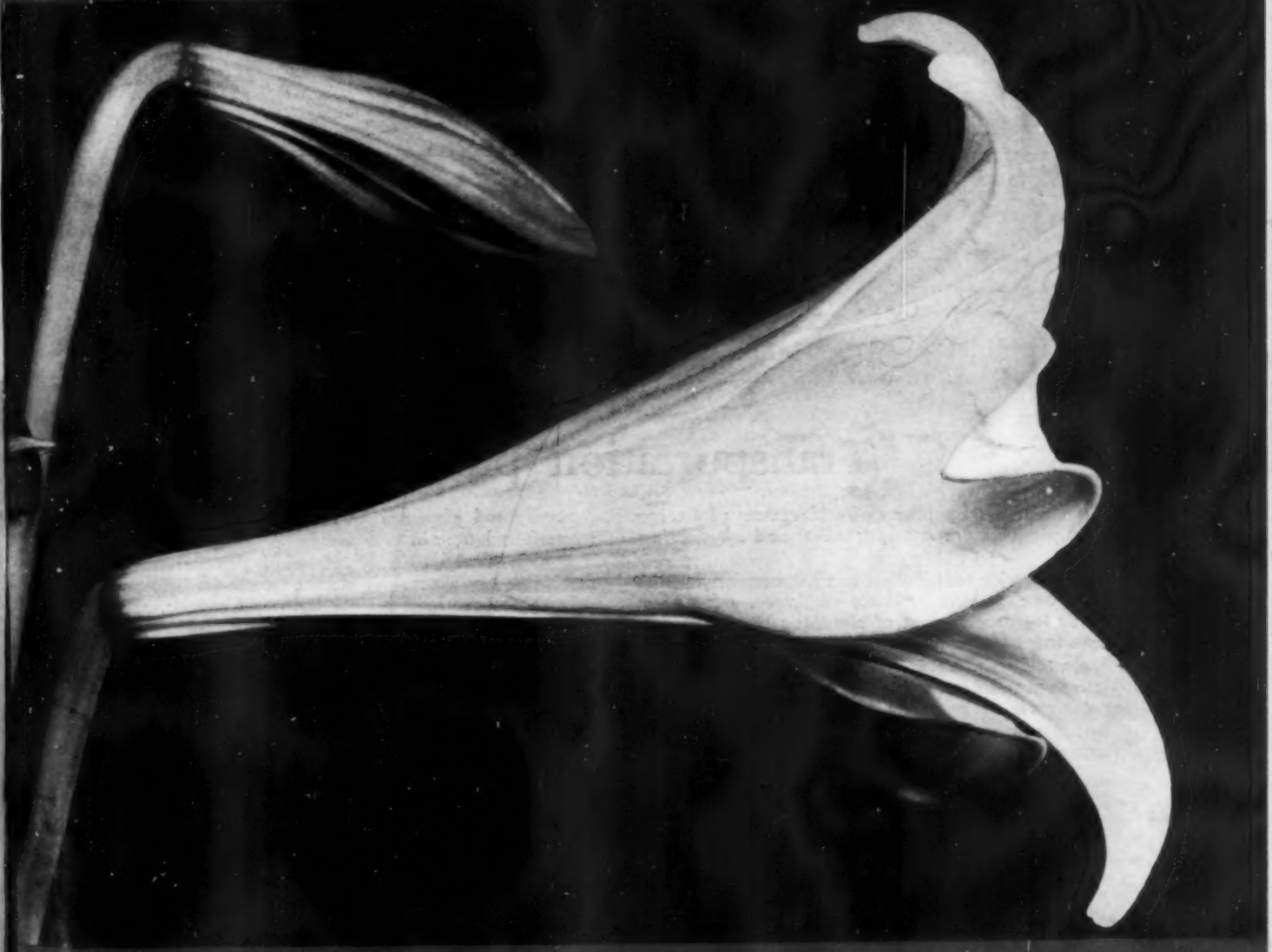

Bigger and Better

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A SCIENCE SERVICE PUBLICATION

1921 TWENTY-FIFTH ANNIVERSARY 1946

Transportation pioneer

The two dominating spheres of achievement of George Westinghouse were *transportation* and *alternating current.*

His first major contribution to transportation was the famous Westinghouse air brake – followed, a few years later, by his development of automatic block-signaling systems for railroads.

Later, this great inventor-engineer pioneered a single-reduction-gear direct current motor which caused sweeping changes in the operation of street railways.

But a unique achievement in the life of George Westinghouse came in 1905 – when he brought *transportation* and *alternating current* together in a single, masterful triumph of engineering.

For, on May 16, 1905, he successfully demonstrated the first *single-phase main-line* electric locomotive before the delegates to the International Railway Congress, at his plant in East Pittsburgh, Pa.

Shortly afterwards, in 1907, Westinghouse electrified the *first main-line railroad* . . . the New York, New Haven & Hartford, between Woodlawn, New York, and Stamford, Connecticut.

This spectacular accomplishment heralded the major electrification of railroads the world over.

Westinghouse
PLANTS IN 25 CITIES OFFICES EVERYWHERE

TODAY . . . A new and revolutionary *type of locomotive is hauling heavy trains over the Pennsylvania Railroad Lines. It is powered by a Westinghouse* geared steam turbine *. . . the smoothest, most compact, most efficient source of steam power ever devised by man. In addition to many products used by railroads, the Westinghouse Electric Corporation also builds electric mine locomotives and other types for industrial use.*

Tune in: JOHN CHARLES THOMAS—*Sunday, 2:30 pm, EST, NBC* • TED MALONE—*Monday through Friday, 11:45 am, EST, American Network*

PHYSICS-ENGINEERING

Future Atomic Jobs

The manufacture of special isotopes for future technical developments will be the main use of atomic power plants, Prof. W. G. Pollard declares.

➤ JOBS FOR FUTURE atomic power plants and the conditions for operation of such units were forecast by Prof. W. G. Pollard of Tennessee University's Department of Physics for members of the American Society of Mechanical Engineers meeting in Chattanooga, Tenn.

In addition to atomic energy as a source of power, comparable to any other fuel, the unique products of fission reactions will be a reason for operation of such installations, according to Prof. Pollard. Plants for the production of various isotopes will be required.

"The isotope is as important in a nuclear reaction," says the Tennessee physicist, "as the molecule is in a chemical reaction. A variety of special isotopes will be required for future technical developments and these will require special plants for their production.

"Such plants require unit operations unfamiliar to present engineering practice. They may be based on thermal diffusion columns, gas diffusion through barriers, mass selection of ions in a magnetic field, ultracentrifuges, or special chemical exchange reactions. The engineering of such plants may be expected to be an important new field for oncoming engineers."

In regard to the future of atomic energy, Prof. Pollard discusses two sorts of nuclear reactions. In the first sort both reacting nuclei contain one or more protons. In the second neutrons take part. The first kind of reaction would take place if we could bring together atoms of some of the light elements closely enough to allow their nuclear forces to act.

Hydrogen would react with lithium, under these circumstances, and give out energy of the order of 30 million kilowatt hours per pound of lithium burned, or nitrogen could be reacted with heavy hydrogen to release eleven and a half million kilowatt hours per pound of nitrogen. Neglecting considerations of thermal efficiency, any of these reactions could be used to operate a 50,000 kilowatt power plant on a continuous basis with a fuel consumption of about a pound per week.

"Not only is this perfectly possible," goes on Prof. Pollard, "but a vast number of power plants of this type are at present in continuous operation throughout the universe. These are the familiar stars, including our own sun."

Enormous central temperatures and enormous pressures in the stars hold together these light nuclei so that the reactions which we observe can take place. Such temperatures and pressures are impossible on earth. In the other sort of reaction, resulting from action of neutrons, which has been made to work here on earth for production of the atomic bomb, the difficulty is that neutrons do not exist as such in nature.

"With the exception of a negligible number in cosmic rays," says Prof. Pollard, "they are all to be found captured in atomic nuclei from which they can be removed only with the expenditure of considerable energy. Thus we are faced with a difficult dilemma. Materials for the first class of reactions are abundant but the conditions to make them go are prohibitive. For the second class the conditions of operation are ideal for a practical atomic power plant, but the essential material for them is non-existent as a natural substance."

"The one reaction capable of maintaining a sustained source of neutrons," says Prof. Pollard, "is the fission reaction. In a light nucleus the repulsion between the protons due to their electric charge, although very strong by molecular standards, is yet only a negligible part of the intense nuclear forces binding the particles together.

"In a heavy nucleus near the top of the periodic table there are, however, so many protons that their repulsion becomes comparable to the nuclear cohesive force. As a result a relatively small disturbance of the nucleus can upset the equilibrium so that the nucleus divides into two pieces which are quickly pushed beyond the range of the nuclear forces.

"Under the great force of repulsion between the large positive charge on each, the two fragments then fly apart with enormous kinetic energies. The heat generated in slowing down and stopping them is the major source of energy in a uranium power plant."

***RESISTS ACIDS**—From a boiling bath of hot sulfuric acid, a laboratory technician lifts two rods of plastic. One has charred and deteriorated. The other, made of Du Pont's new "Teflon" tetrafluoroethylene resin, is not affected at all by the highly corrosive acid. "Teflon" is not attacked even by aqua regia, which dissolves gold and platinum.*

SEISMOLOGY

Tidal Wave Caused by Quake off Unimak Island

➤ THE SUBMARINE earthquake that set the destructive tidal wave in motion across the Pacific on Monday, April 1, had its epicenter about 70 miles south of Unimak island, which is the first and largest of the Aleutians, just off the tip of the Alaskan peninsula. Seismologists of the U. S. Coast and Geodetic Survey, who made the determination after studying data wired and radioed to Science Service from seven observatories, gave the geographical coordinates of the spot as latitude 53.5 degrees north, longitude 164 degrees west.

There were three main shocks, all severe. The first and strongest recorded its time of initiation on the instruments as 7:28.8 a.m., EST, which is the equivalent of 1:58.8 on Unimak island—which happens also to be Hawaiian time. The second shock came five hours later, and the third followed 11 hours after the second.

The sea bottom has a very curious formation at the point where the earthquake occurred, the Coast and Geodetic

Survey scientists said. It is about 100 fathoms (600 feet) deep there, but begins to slope downward very steeply, reaching a depth of 1,000 fathoms (6,000 feet) within 15 or 20 miles. Earthquakes have been frequent in this general region, but nothing of major importance has been recorded from this particular locality.

The shock was undoubtedly a "world-shaker," for the instruments in the seismological observatory at far-off Wellington, New Zealand, recorded it. Other stations reporting were the Dominion Observatory at Ottawa, Canada; the observatories of the Jesuit Seismological Association at Georgetown University and Weston College in Massachusetts, and the stations of the U. S. Coast and Geodetic Survey at College and Sitka, Alaska, and Tucson, Ariz.

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ENGINEERING

Atomic Heat Problem

Thousands of millions of degrees Fahrenheit temperature are reached by individual atoms, but resulting fluid can be handled by already familiar processes.

➤ ENGINEERS faced with new problems in the utilization of heat from atomic power plants will at least have as a starting point the familiar conditions of heat exchange, it appears from a paper given before the American Society of Mechanical Engineers, by Prof. W. G. Pollard of the department of physics of the University of Tennessee.

Thousands of millions of degrees Fahrenheit temperature are reached by the individual atoms of fission products in an operating atomic pile. But after these have been brought into equilibrium with the coolant, the resulting fluid, heated in the process, can be handled in boilers designed for steam or mercury vapor in processes already familiar.

The problem of bringing the intensely hot particles into equilibrium with the coolant is not unlike mixing one's bath water. The user of atomic energy can, within practical limits, choose the temperature of the resulting mixture, for the fission fragments are at so high a temperature that any man-made temperature will still be cool by comparison.

This intense heating results from collision of atomic particles. The fission fragments are stopped, for the most part, in the metal rod where they are produced. This results, says Prof. Pollard, in an intense heating of the rod, so that arrangements must be made for efficient heat transfer from the rods to the coolant, which is air, water or molten bismuth flowing through the pile where fission is carried on.

"It is possible," says Prof. Pollard, "to heat the coolant to any desired temperature because the fission fragments are liberated in the metal at a temperature of many million degrees Fahrenheit. The hot coolant will be radioactive on leaving the pile but it can be passed through a boiler or heat exchanger to produce steam or mercury vapor at high pressure and then returned to the pile."

Another important aspect of pile design and operation outlined by Prof. Pollard involves protection against radioactivity. Throughout the body of the rods of fissionable material in a going pile small amounts of elements like barium, krypton, iodine, yttrium, etc., are being generated. After coming to thermal equilibrium and collecting some electrons to complete their transmutations, these new elements undergo a whole series of radioactive disintegrations, like radium, before reaching stable forms. Gamma rays given off in this process must be absorbed by the thick screens which must always surround the pile, and this absorption again creates heat and the necessity for cooling.

"The fast fission neutrons," says Prof. Pollard, "are produced at a steady rate in the metal at a temperature of some 10,000,000,000 degrees Fahrenheit. They represent a very dilute but very hot gas which diffuses out into the moderator where it is cooled down by mixing to the temperature of the moderator. As a cool gas it diffuses back into the metal where it can produce more fissions. This represents a true convective heat transfer." The problems of nuclear reactions, the energies involved and the problems of handling radiations are well known in physics, says Prof. Pollard, but have not been generally included in engineering training.

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Crab grass, the lawn pest, is an annual and prolific seeder; one plant may produce as many as 300,000 seeds.

HORTICULTURE

Garden Favorites Include Tomatoes, Beans

➤ IF YOU HAVE a garden, you will probably plant several of the following, depending upon the size of the plot you plan to cultivate: tomatoes, string or wax beans, onions, lettuce, radishes, beets and carrots. Each of these seven vegetables were grown in more than half of the 1945 Victory Gardens, a survey conducted by the Bureau of Agricultural Economics shows.

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American *eels* are confined to the Atlantic and Gulf coasts and streams.

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BACTERIOLOGY

Germ-Free Animals

Have been reared through the third generation in sterilized closed cylinders. Will be valuable for dietary and medical researches.

➤ GERM-FREE animals, that have never had a bacterium in their bodies, have been reared in the laboratories of bacteriology at the University of Notre Dame, and carried through to the third generation. This difficult feat, with results important for biological research, was accomplished by Prof. James A. Reyniers of the Notre Dame faculty.

Normally, all animals (including man) are germ-free until they are born, but then immediately pick up a full set of germs with their first food and their first breaths. By bringing young rats and other animals to birth by caesarian operation inside a completely sterilized cylinder, feeding them sterilized food and admitting only filtered air, Prof. Reyniers was able some years ago to produce and rear germ-free animals.

These lived perfectly normal lives in their isolation from our germ-swarming world, but they would not breed. Prof. Reyniers suspected that something was lacking in their diet, but for a long time he was not able to overcome the difficulty. Lately, however, he found the correct diet, and his germ-free rats began to breed as rapidly as normal rats do. By the time the third generation had been born, the germ-free cylinder in which the animals lived was getting pretty crowded; and he needed it for some other work anyway. However, by this time he had proved his point, so he took the rats out and ended the experiment.

The second- and third-generation germ-free rats, Prof. Reyniers said, were exceptionally sleek and healthy. Their muscles and other tissues, on microscopic examination, "looked just like the idealized drawings you find in anatomy textbooks."

Scientists can make effective use of germ-free animals in dietary, medical and other researches, because when you try a new food combination, or a new medicine, on one of them you will know that what happens is its own reaction, and not the response of an animal conditioned by a lot of germs in its insides.

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CHEMISTRY-MEDICINE

Key to Streptomycin

It is most effective against germs that grow best in the air; this may be the key to way in which the drug interferes with growth of disease germs.

➤ STREPTOMYCIN, potent germ-killer like penicillin for aid in our war on disease, is most effective against those germs that grow best in air. In this fact may lie the key to the way in which this substance from the earth interferes with the growth of disease germs, Dr. Amedeo Bondi, Jr., Dr. Catherine C. Dietz and Dr. Earle H. Spaulding of Temple University School of Medicine in Philadelphia, state. (*Science*, March 29)

The antibacterial action of streptomycin against such disease germs as staphylococci is significantly better when the jar in which the germs are growing is open than when it is kept airtight, the bacteriologists noticed. These same disease germs, however, grow best when there is plenty of oxygen.

Duplicate tests with various species of bacteria at a temperature of 99 degrees Fahrenheit were tried with and without air. From 2 to 16 times as much streptomycin was found necessary to arrest the growth of bacteria for 24 to 48 hours when air was excluded than when plenty of oxygen was available. With one exception these results were observed with organisms which normally had their maximum growth when there was plenty of oxygen.

The activity of streptomycin was greatly diminished by such compounds as cysteine, sodium thioglycollate, sodium bisulfite and sodium hydrosulfite. Whether this interference is due to a lowering of oxygen tension or to some specific chemical reaction or both acting simultaneously, will probably be discovered with further research.

It is conceivable that in certain parts of the body where organic reducing agents are present or where a low oxygen tension exists, larger concentrations of streptomycin may be necessary to inhibit the growth of bacteria, they point out.

The antibacterial action of streptomycin, they suggest, may be due to its ability to block some enzyme system, oxidative in nature. This system would seem to be essential only to the growth of susceptible bacteria of the type that grow best in air. Bacteria that grow best when air is excluded do not possess this enzyme system and therefore streptomycin is not such an effective weapon against them.

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CHEMISTRY

2,4-D Promises Usefulness In Stopping Weeds

➤ 2,4-D, THE NEW weed-killing chemical, shows promise of being able to stop obnoxious growths before they even get started, in experiments at the U. S. Department of Agriculture's great experiment station at Beltsville, near Washington, D. C. A concentration equivalent to only 1.5 ounces of 2,4-D in the top inch of an acre of soil was found sufficient to prevent or materially retard the sprouting of weed seed of sensitive species, such as wild mustard. The ordinary rate of application as a spray on foliage of grown weeds is 1.5 pounds per acre—16 times more than the seed treatment.

An important tactical consideration in using 2,4-D in this way, Dr. John W. Mitchell and Dr. P. C. Marth of the station staff point out, is the loss of weed-killing power by the chemical in moist soil. It can therefore be used to kill the weeds in fallow fields in humid regions because it will no longer be there to harm crop plants the following season. On the other hand, the compound retains its plant-killing ability for as long as 12 to 18 months in really dry soil.

In other tests at Beltsville, 2,4-D was shown to be a satisfactory means for the control of Japanese honeysuckle, an introduced woody vine that has become a terrible pest along a considerable stretch of the Middle Atlantic seaboard. In a 1-to-1000 solution in water, two sprayings, in March and June, made a complete kill of the vine. Spraying an acre in this way would cost somewhere around $10 or $12. Further tests are now under way, to determine whether the method can be recommended for general use.

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AVIATION-MEDICINE

Device Pulls Ripcord

Barometer-like instrument does this automatically to make descents from high altitudes safer. Designed by the Army Air Forces' Aero Medical Laboratory.

➤ A BAROMETER-LIKE device that automatically pulls the ripcord on a parachute to make descents from high altitudes safer was described by a group of scientists at the opening session of the Aero Medical Association in Chicago.

The instrument was designed by the Army Air Forces' Aero Medical Laboratory at Wright Field and the Friez Instrument Division and was manufactured by the Friez Company. The scientists who worked on the problem of parachute-opening shock and an instrument to overcome it are Maj. G. A. Hallenbeck, now at the Mayo Clinic; Maj. G. L. Maison, now at Boston University School of Medicine; Capt. Kenneth E. Penrod, now at Iowa State College; Ralph E. Sturm, of the Friez Instrument Division, Bendix Aviation Corporation; and Ernest E. Martin, of the Aero Medical Laboratory.

When a man jumps with a standard parachute at altitudes of 20,000 to 25,000 feet, he is likely to be injured by the shock or impact when the chute opens, Maj. Hallenbeck explained. At altitudes above 30,000 feet this impact is almost certain to produce injuries.

Experiments in which dummies were dropped from a B-17 at altitudes up to 40,000 feet demonstrated that at the velocities at which a freely falling man would be expected to travel, the impact at parachute opening is greater the higher the altitude of parachute opening. Brief impact forces as high as 7,000 pounds were recorded when the standard 24-foot nylon parachute decelerated 200-pound dummies at an altitude of 40,000 feet.

One way to avoid the danger of injury from parachute opening shock forces at high altitudes is to have the man fall freely to altitudes below 20,000 feet before opening his parachute. Such free fall also lessens the exposure to cold and oxygen lack at high altitudes. It is not without danger, however, because unconsciousness from oxygen lack, cold, perhaps even fear, and other unknown factors can cause a man to fail to pull the ripcord.

The instrument designed to overcome these dangers and make free falls safe consists of a small powder charge which when electrically fired pushes a piston which pulls the parachute ripcord. The electrical circuit is completed by a micro switch controlled by an aneroid capsule, similar to that in many barometers, which is sensitive to changes in the air pressure which surrounds it. The position of the aneroid capsule can be set so that its contraction during descent closes the circuit and causes the powder charge to fire at any desired pressure altitude between 500 to 20,000 feet.

A safety or arming switch is, of course, necessary to prevent the device from pulling the ripcord during normal airplane descent.

Successful tests in which dummies were dropped from aircraft have shown that the design of this device is sound. With such a device a man jumping from an airplane will fall freely until he reaches the altitude at which the parachute opening device is set. At this point the parachute ripcord will be pulled automatically. The instrument does not interfere with manual pulling of the ripcord.

The studies at the Aero Medical Laboratory also showed that silk 28-foot parachutes produce approximately 50% more shock force than do nylon 28-foot parachutes at the same altitudes and air speeds. Oddly, inflation of 28-foot nylon parachutes produced slightly less shock force than did 24-foot parachutes at the same altitudes and air speeds.

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BOTANY

Easter Lilies Will Be Bigger and Better

See Front Cover

➤ EASTER LILIES are going to be bigger and better—bigger by a hundred per cent, better because they will be solid and last much longer in their beauty. Plants have already been raised with flowers fully seven inches across, their trumpet-like throats as much as an even foot deep. They stay in bloom much longer, too, partly because the petals are firmer and partly for reasons of internal physiology. One of the new lilies is shown on the front cover of this SCIENCE NEWS LETTER.

These miracle-lilies are not ready for the market yet; they are still growing in greenhouse benches at the great experiment station of the U. S. Department of Agriculture at Beltsville, Md., a short distance outside Washington. Magnificent though they are, Dr. Samuel L. Emsweller, the scientist who is working on them, feels that they can still be made a little finer before being released into the hands of private growers for general propagation and sale.

These lilies are one of the practical results of the half-accidental discovery, some years ago, of the ability of colchicine, an old-fashioned rheumatism remedy, to change the course of evolutionary development in plants by doubling the number of chromosomes, the heredity-bearing bits of living matter in the cell nuclei. The new lilies were produced by a doubling-up of these essential cell contents in Easter lilies of the ordinary type.

The resulting plants are taller and sturdier-looking, to match the huge blooms they bear. The tissue of the petals is solider and thicker, crisp-looking but not brittle. The flowers are strong as well as beautiful.

The reason for their longer life lies partly in this strength, partly in the fact that, like many plants with doubled chromosome numbers, they are sterile—incapable of producing seed. In ordinary lilies, when the physiological processes leading toward seed formation have been well started, the flower has no further reason for being and the petals begin to collapse. In sterile flowers this does not happen; the petals keep their perfect shape and pearly luster a great deal longer.

Other flowers are being "doubled and redoubled" in the same way. One fine series now in bloom in the Beltsville greenhouses consists of bright-blossomed snapdragons with much taller stalks and much bigger flowers than their parents. But one cannot help feeling, as he follows their originator around among the benches, that Dr. Emsweller's greatest pride and joy are his giant Easter lilies.

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When *hens* fail to get enough calcium in their feed, they draw it from their bones, up to about 25% of their calcium content.

Moxa, a nostrum for Oriental ills for generations, was a secret ingredient in the Japanese navy gas mask; the filter in the mask was made of silk, cotton and fibers of the magical weed.

ELECTRONICS

Sonar Defeated Subs

The Navy reveals the story of the battle against undersea raiders. Sonar credited with bringing victory against Nazi U-boats.

➤ SCIENTIFIC superiority that developed sonar for accurately locating submerged enemy submarines was credited with bringing victory against Nazi U-boats in World War II as the Navy revealed the story of the battle against undersea raiders.

Sonar, improved during the war by cooperative work in Allied laboratories, was credited for the sinking of a majority of the 996 enemy submarines sent to the bottom during hostilities. The Navy said that 70% of the undersea "kills" were made by British ships and 30% by U. S. vessels.

Termed the only effective method of detecting completely submerged submarines, World War II sonar is a highly developed system for echoing sound waves sent out under the ocean's surface. Submarines were detected by the echoed sound, and the development of echo-ranging permitted ships accurately to locate and track down submerged U-boats.

Before Pearl Harbor, American Navy experts were cooperating with British scientists in combining the U. S. sonar with the best features of British systems. From this cooperative venture came the equipment that turned the tide to victory in the Battle of the Atlantic during the spring and summer of 1943.

The name sonar is derived from the words sound, navigator and ranging, while the British equivalent, asdic, is a holdover from the initials of the Allied Submarine Devices Investigation Committee in World War I.

Installed on ships, sonar includes a retractable projector that is lowered under the keel of a ship to send out sound waves and receive their echoes. The projector is covered by a streamlined dome to eliminate water noises that might interfere with sound reception.

The driver that produces the sound signals is usually located close to the projector, while the receiver-amplifier and indicating equipment are in a "stack" high up on the ship near the bridge.

Key device in the operation of sonar is the transducer in the projector that sends out and receives the "pings" that tell of the presence of submarines.

Asdic used quartz slabs sandwiched between steel disks, while modern sonar's transducer is a series of magneto-striction tubes, three inches long with a diameter of three-eighths of an inch. These tubes, made of a nickel alloy, have coils of wire wound around them to form small electro-magnets. They elongate or contract with changes in their magnetic flux.

Electrical energy from the transmitter moves the tubes, vibrating the diaphragm of the transducer to send out the "pings." When the "pings" are echoed back, they generate an electric current from the tubes that produces a different sound.

This sound varies according to the target that causes the echo, so that Navy sonarmen can distinguish between the signal from the ship's propellers and submarines.

Highly developed direction and range equipment show the distance and bearing of the echoed sound so that submarines could be accurately located for attack.

Enemy torpedoes were also detected by the sonar ears of ships and several cases are recorded of ships that were able to dodge approaching undersea attack by means of rapid maneuvers.

Underwater sounding devices for navigational use were developed as long ago as 1902, and a crude type of sonar was used in World War I with some success. The advances that led to the modern equipment were produced between the wars, but the production of escort vessels and sonar equipment and the training of technicians delayed the anti-submarine campaign.

During the war, previous research and military necessity combined to produce the most effective equipment yet developed to combat submarines.

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***DEFEATED SUBS**—This is a side view of the sonar control console, test installation, with operator tuning equipment. Controls are grouped in an assembly called the Stack, usually located in or near the pilot-house. Official U. S. Navy photograph.*

SEISMOLOGY

Earthquake Detectors Can Also Predict Weather

➤ INSTRUMENTS used to detect earthquakes can be used in predicting the weather. Seismographs, which register the tremors traveling through the earth from far-off earthquakes, also register the much smaller shiverings caused by the pounding of heavy storm waves on the shore. These lesser vibrations, called microseisms, also travel through the earth's stony crust, often for long distances.

At the meeting of the American Association for the Advancement of Science, Rev. James B. Macelwane of St. Louis University told how a method was worked out by which the approximate location of a storm center can be located, and its movement traced as it travels off shore. It involves the use of data from three separate seismograph stations, the combined records showing the direction from which the microseisms are coming. Father Macelwane told how such an experimental setup was able to follow the great hurricane of 1938 as it moved northward off the Atlantic coast.

Since the validity of the microseismic method has been established, it is being put to practical use by several cooperating government agencies in locating and tracking hurricane centers in the Caribbean area. Lt. Comdr. M. H. Gilmore, formerly a seismologist with the U. S. Coast and Geodetic Survey, told how three seismological stations, in Florida, Cuba and Puerto Rico, are already "watching the wiggles" for signs of approaching tropical storms.

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PUBLIC HEALTH

Smallpox Cases on West Coast Not an Epidemic

➤ THE SCORE of smallpox cases with seven deaths from the disease in Seattle and the additional seven or eight cases in San Francisco, recently, are not enough to constitute an epidemic, authorities at the U. S. Public Health Service state.

Twice as many cases were reported during an outbreak in Pennsylvania three years ago. At that time health authorities warned against panic over the situation. Prompt subsidence of the outbreak after vaccination of exposed population groups bore out their opinion that there was no cause for alarm.

The occurrence of sporadic cases among troops returning from the Orient is "very disquieting" and cause of considerable unhappiness in the Office of the Surgeon General of the Army. The fact that a case or two occurs on a returning troop ship, in spite of the fact that the entire Army has been vaccinated against smallpox, is explained by medical authorities at the War Department as the result of occasional failures that might well be unavoidable in vaccination of eight or 10 million persons.

Smallpox is caused by a virus. It is very readily spread through the secretions of the nose and throat even before the spots come out on the skin and later through particles from the skin of the patient. The incubation period of the disease is usually between eight and 16 days, so that unprotected persons are not out of danger until at least 16 days following exposure to the disease.

Smallpox varies in severity. Mild strains of the virus have a fatality rate of only 1% but severe strains may kill as many as 30 out of 100 patients. The cases among returning troops and on the West Coast, so far as is known, are not particularly severe.

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METEOROLOGY

Weather to Be Studied At Extreme Heights

➤ THE U. S. NAVY is planning to study the weather at extreme heights from 100,000 to 500,000 feet, by means of rockets bearing automatic recording instruments, which have been given the name "rocketsonde". Plans for this project, which will have the cooperation of this country's leading universities, were outlined before meteorologists at the meeting of the American Association for the Advancement of Science by Lt. Comdr. Daniel F. Rex, of the Navy's Office of Research and Invention.

Data thus obtained are expected to be of especial value in computing the radically new ballistics tables that will be needed in the use of ultra-long-range rocket weapons. They will also probably be useful because of the influence of events in these very high altitudes on the weather down where humanity walks and flies.

The things that conventional weather instruments measure—temperature, humidity, pressure—are of little interest in the vacuum-like atmosphere so far above the earth, Comdr. Rex said. Instead, radar tracking will tell of the deflection of the soaring missile from its calculated line of flight, thus giving an idea of what winds are blowing at altitudes 10 times or more higher than planes have ever flown. Instruments borne by the rockets will tell of the intensity of the sun's radiation.

The first rocketsondes which will be sent up this summer in connection with the planned tests of V-2 rocket-bombs will have a diameter of 15 inches and an over-all length of 24 feet, and will weigh a little over a ton, fully loaded. Of this weight, only 325 pounds will be available for a "pay-load" of instruments.

Comdr. Rex also showed films of V-2 launchings, made by American cameramen in Germany, showing captured weapons being sent up by German technicians.

Science News Letter, April 13, 1946

CHEMISTRY

Tensile Strength of Cotton Yarn Increased 40%

➤ COTTON YARNS are given additional strength by the application of a new chemical, members of the American Association of Textile Chemists and Colorists were told by Dr. Donald H. Powers of Monsanto Chemical Company. The tensile strength of the yarn may be increased up to 40%, he declared.

The improvement is effected through mill applications of a special sub-microscopic colloidal silica called Syton, he said. This chemical was developed by the company to make sheer stockings run-resistant and to take the shine off serge. When applied to cotton sliver in concentrations of 1% to 3%, the interfiber friction is increased and it was possible to increase the tensile strength as stated, and to decrease the twist as much as 40%, Dr. Powers explained.

Science News Letter, April 13, 1946

IN SCIEN

MEDICINE

Delay in Malarial Treatments Not Justified

➤ ALTHOUGH delay in giving quinacrine (atabrine) to people suffering from malaria of the type contracted in the Pacific may cut down the number of times the patient is likely to suffer a relapse, such a drastic measure does not seem to be justified. A person would naturally tend to get well even though prompt treatment is given in the case of acute attacks, Lt. Col. Harry A. Gordon, Col. Alexander Marble, Capt. William W. Engstrom, Capt. Henry A. Brunsting and Lt. Col. Stuart W. Lippincott of the Army Service Forces, Eighth Service Command, Harmon General Hospital, Longview, Tex., state. (*Science*, March 29.)

Because so many people had relapsed after apparently recovering from vivax malaria of South and Southwest Pacific origin, it has been suggested that perhaps use of the drug interfered with the body's natural tendency to develop immunity. To test this suggestion, the physicians tried withholding treatment on volunteers at the Army hospital.

A total of 69 soldiers volunteered for the test. They were given the disease by American anopheline mosquitoes infected by 10 volunteer soldiers with malaria acquired in the South or Southwest Pacific.

The drug quinacrine dihydrochloride was not given the malaria patients until they had had from 8 to 15 paroxysms with an average of approximately 40 hours of fever at a temperature of 104 degrees. This was reached on the average in approximately 20 days. The doctors kept tabs on the patients until either a relapse occurred or 60 days had passed without relapse.

It was found that 45, or 65%, of these patients had a relapse. Of the 16 patients observed following quinacrine therapy during the first relapse, 69% had a second relapse. This is little better than would have been expected had these patients been given quinacrine promptly. The Medical Corps officers therefore believe that delaying the treatment can hardly be considered of practical significance.

Science News Letter, April 13, 1946

NCE FIELDS

MEDICINE

Pernicious Anemia Helped by Thymine

➤ STRIKING anti-anemia properties of a synthetic chemical called thymine were reported by Dr. Tom D. Spies of the University of Cincinnati at the annual meeting in New York of representatives of foundations and philanthropists aiding in financial support of the university's nutrition studies at Hillman Hospital, Birmingham, Ala.

When thymine is given in pernicious anemia, "the patient who had so long been pale, listless and weak then experiences a sudden and dramatic increase in his strength, appetite and vigor," Dr. Spies reported. "He now sits up in bed and insists he is strong enough to go home and to work."

Red blood cells which have been arrested in their development in the bone marrow of pernicious anemia patients "form huge islands of regeneration and within three or four days after treatment is begun, new cells begin pouring into the blood."

Thymine is not to be confused with thiamin, which is also called vitamin B_1. Thymine is a part of nucleic acid, Dr. Spies explained, and gets its name from the fact that it was first isolated from the thymus gland.

Good results in pernicious anemia have also been obtained with a vitamin, folic acid, Dr. Spies reported. While the two chemicals have a similar effect, doses of synthetic thymine must be several thousand times as large as those of synthetic folic acid.

Pernicious anemia patients heretofore have been treated with liver, discovered in 1926 to be effective in this ailment, and with liver extract, brewer's yeast and ventriculin.

Science News Letter, April 13, 1946

CHEMISTRY-BIOLOGY

Keeping Tissues Alive With Unknowns Criticized

➤ BIOLOGICAL research workers who grow bits of chick heart or other animal tissue in nutrient fluids containing blood serum, meat juice and similar liquids were criticized before an audience of biologists at the meeting of the American Association for the Advancement of Science by Dr. Philip R. White, of the Research Institute of the Lankenau Hospital, Philadelphia. These fluids of animal origin are mixtures whose chemical composition is still very much in the dark, Dr. White pointed out; consequently results of experiments conducted with them must inevitably contain unknown factors—they are at best incomplete answers.

Dr. White won international notice some years ago as the first scientist to make detached pieces of plant tissue grow in a solution of completely known chemical makeup, containing sugar, mineral salts and vitamins. He undertook to work up a solution containing no "unknowns" suitable for animal tissue cultures. Using sugar, mineral salts, vitamins and amino acids, he succeeded in keeping a culture of chick-embryo heart alive and beating for six weeks. He also scored similar partial successes with other animal tissue cultures. He regards this work as only the beginning, and hopes eventually to keep animal tissue alive indefinitely in chemically known culture fluids, as he has already done with plant material.

Science News Letter, April 13, 1946

ENGINEERING

Amphibious Vehicle Is Neither Car nor Boat

➤ AN AMPHIBIOUS vehicle, that is neither a boat on wheels nor a waterproofed truck but was designed from the ground up for its special job, is covered by U. S. patents 2,397,791 and 2,397,792, issued to two Detroit inventors, C. F. Kramer and F. G. Kerby, assignors to the Ford Motor Company. While it was avowedly developed for military purposes, it should be useful to ranchers, foresters, engineers and others who have to traverse wild country where bridges are scarce.

The vehicle has a body (or hull) shaped like a square-ended, flat-bottomed boat, with sides recessed for the four wheels. The engine compartment, forward, is accessible through a double hatch; forward of this is a smaller hatch that admits air to the radiator during land operation but is shut when the vehicle enters the water. Cooling air is then drawn through ducts opening into the cockpit. A propeller and rudder make navigation possible.

Since the vehicle has some resemblance to the Army's famous "duck", except that it is smaller and more compact, it might well be nicknamed the "duckling."

Science News Letter, April 13, 1946

CHEMISTRY

Lightweight Plastic To Find Many Uses

➤ LIGHTER than cork but stronger and a better insulator is the report of Du Pont chemists on the latest plastic, cellular cellulose acetate or "CCA" for short.

Uses as the strong, lightweight cores in airplane floor panels, tail assemblies and wing structures, and in refrigerators, luggage and sections of prefabricated houses are predicted for "CCA."

Uniform in density and capable of being tooled or shaped with woodworking tools, the new plastic may also be used in airplane instrument cases, furniture, lockers for frozen food and as core material for such diverse items as refrigerated truck bodies, boats or light toys, according to the chemists who developed it.

Bonded between two panels of metal, wood or another plastic, the new lightweight material will not be compressed except under extreme pressure. As an insulator, it has the properties of cork, balsa wood and other rigid insulating materials with less weight.

Du Pont chemists say the idea for "CCA" was an accident. When a cold slug of cellulose acetate clogged a molding machine, it was heated to help dislodge it. The result was the first cellular cellulose acetate.

"CCA" is now produced by heating a mixture of cellulose acetate with other materials under pressure. It comes out as a mass of pin-point size bubbles that become hard and rigid when chilled.

Science News Letter, April 13, 1946

ICHTHYOLOGY

"Elephant Fish" Among Peruvian Species Collected

➤ STRANGEST fish discovered by an expedition from the U. S. Fish and Wildlife Service in the waters of Peru is one called the elephant fish.

The name comes from a long proboscis with a leaf-shaped flexible appendage that hangs over the fish's mouth. Ichthyologists say it belongs to the same group as a fish previously found off the coast of South Africa.

The Latin name for the unusual sea creature is *Callorynchus callorynchus*, but its unique trunk will probably perpetuate the name elephant fish.

More important to scientific knowledge is the discovery of 51 new species of fish by the scientists, who spent nearly a year studying Peruvian marine life.

Science News Letter, April 13, 1946

RADIO

Forecasting for Radio

Warnings of approaching storms which will interfere with shortwave broadcasts can now be made in sufficient time to be used in routing important messages.

By MARTHA G. MORROW

► MEASURING radio echoes is one of the techniques perfected under war secrecy that allows science's most accurate radio forecasting, a new service to radio operators and the public. Radio experts can now warn of approaching storms in the ionosphere which will interfere with shortwave broadcasts from such overseas points as London, Stockholm and Moscow. What is also important is that these forecasts, like weather forecasts, are made in sufficient time to be used in routing important messages and broadcasts.

Several days ahead the forecasters venture a guess, based on careful observations and calculations, as to whether the radio reception on shortwave sets will be good or bad. Three months in advance they predict the best frequency for large radio companies and radio amateurs to use in getting messages through to listeners in such distanct places as Athens, Tokyo and Lima.

Echoes from radio reflecting layers in the upper atmosphere, spots on the sun, absorption of radio waves and other such information is used in these latest of science's forecasts. Detailed records painstakingly made in the past and up-to-the-minute communications telephoned and telegraphed daily from research stations all over the world are used by radio experts at the National Bureau of Standards in making these predictions.

Interestingly enough, both radar, one of the great developments of the war, and this new radio forecasting can be traced back in their scientific beginnings to radio echo experiments conducted at least two decades ago.

The S O S of a ship in distress at sea, the beam that guides a plane to a safe landing in a cloudburst, the messages with which explorers keep in touch with those at home, and the globe-encircling signals of radio amateurs and professionals are all made possible by reflection from one of the ionized layers. These layers consist of atoms with all the electrons knocked out. Even the lowest of the layers is many, many miles above the earth, several times higher than a man has ever gone in either plane or stratosphere balloon.

When a sending station issues a series of radio signals, the energy travels in two ways. One wave travels along the ground, gradually becoming less powerful as it spreads out over a greater area and as energy is absorbed from it. The sky wave travels upward until it reaches the ionized layer of the atmosphere and then is reflected back in much the same manner that light is reflected from a mirror.

A receiving station located only a short distance from the transmitting station will pick up the signal from the ground wave first, then receive it as an echo from the sky wave. A station a hundred miles or so away will probably receive only the sky wave.

Depends upon Frequency

Whether radio waves will be reflected by the lower ionized layer about 40 or 50 miles above the earth's surface, or whether they will penetrate it and continue up to some greater height, to be reflected by one or another of the higher layers, sometimes extending 250 miles above the earth, depends upon the frequency or wavelength of the impulse.

The greater the frequency or the shorter the wavelength, the higher will the radio impulse penetrate into the ionosphere and the longer will be the time interval before the echo returns. The maximum frequency which will be reflected by each layer, called the critical frequency or maximum usable frequency for that layer, varies with the time of day, season of the year, longitude and latitude, and also with solar activity as shown in the sunspots.

In broadcasting overseas, it is best to use one of the highest permissible frequencies because when too low a frequency is used, the radio waves tend to be absorbed by the ionosphere. The frequency that a powerful radio station or "radio ham" uses in broadcasting a message would lie within the band of possible frequencies, between the highest frequency that will bounce back from the upper reflecting layer and the lowest frequency that will get through to the reflecting layer without being absorbed.

By combing files kept by astronomers as well as by broadcasters and radio listeners, and by checking day-to-day reports, radio experts at the National Bureau of Standards have noticed a number of general trends useful in making predictions. A higher radio frequency can ordinarily be used in daytime in winter than in summer, whereas at nighttime a higher frequency generally can be used in summer than winter. When the path of the radio waves, following the great circle, lies near the equator, shorter waves can be used in broadcasting than when the path goes through the polar regions.

Shortwave broadcasts are more likely to get through when they pass through the equatorial regions than through the polar regions. Ionospheric storms start in the polar regions and from there spread out through the temperate zones. If the storm becomes violent, the reception of local broadcasts may become poor and telegraph messages fail to get through. Few violent storms, however, extend into the tropics, upsetting communications there.

When a broadcast is being sent by a station only 2500 miles or less away, conditions of the ionosphere midway between the stations are considered in deciding the frequency to use and in determining how loud or faint the reception will be. When the stations are quite far apart, however, the conditions of the ionized layer at two or more points must be taken into account. The lowest critical frequency of these points is the one which determines whether a message gets through or not.

Two Frequency Bands

When the stations are less than 2500 miles apart, two frequency bands are usually employed for communication or broadcasting. One is used during the day and the other at night. When the stations are quite distant, three or more frequencies have to be used. One is employed at night, one during the day, and a third, intermediate one, for hours around sunrise and sunset.

It is normally possible to use higher frequencies during the day than at night. The highest radio-reflecting layer, extending from around 100 to 250 miles above the earth, is always present, while the lower layers are present only during the day. It is the sun's ultraviolet rays that ionize the atmosphere. The upper

TEST STATION—Intensities of broadcasts picked up from ten test stations in such distant places as England, Honolulu, Africa and Chile are continually recorded at the Sterling, Va., Radio Receiving Station of the National Bureau of Standards. These records are used to study the amount radio waves are absorbed by the ionosphere.

regions, where the air particles are spaced so far apart, stay perpetually ionized. The lower ones, ionized during the day, return to normal at night.

Geomagnetic and ionospheric storms, experts at Interservice Radio Propagation Laboratory of the National Bureau of Standards found, tend to recur 27 days later, this being the time the sun takes to make a complete rotation so that the disturbed surface is again facing the earth. It is easier, they found, to foretell what radio reception will be several days ahead when sunspot activity is at a minimum than when the sun's face is quite pock-marked.

Prolonged, moderate disturbances are frequent during sunspot minimum. Briefer, more erratic storms tend to occur during sunspot maximum. But as data for a complete sunspot cycle, about 11 years, are not yet available, further study is needed to work out these general trends.

When an ionospheric storm is in progress, a lower and lower frequency must be used as higher ones escape through the ionized layer. On the other hand, more and more of the lower frequencies are absorbed and fail to reach the receiving station. When the frequency band is so reduced at both ends that nothing gets through, radio broadcasts are completely blacked out.

A warning of approaching trouble in the ionosphere which will make the announcer's voice sound mushy or weak, or cut him off the air entirely, is now being broadcast for paths across the North Atlantic. If broadcasts from London, Berlin and Paris are likely not to get through, "W's" (dot, dash, dash in Morse code) follow the time announcement over WWV at 15 and 45 minutes past the hour. Sent out from Washington D. C., the warning may be received at 2.5, 5, 10 and 15 megacycles, audible at almost any place in the world. If conditions are quiet, "N's" (dash, dot in code) follow the time announcement over the shortwave broadcast.

Radio experts, developing new techniques as they perfect this new type of forecasting, have a pretty good batting average. Checking the warnings with actual radio reception, it is found that they have warned of seven out of ten storms.

These forecasts are being developed to the point that those listening to a world-wide hook-up will no longer be bothered by having a broadcast from London ruined by sputters or having Moscow fade out entirely. Instead of those tantalizing pauses after the announcer says "Come in Berlin," it will be known in advance whether broadcasts from such far-off places can get through.

Science News Letter, April 13, 1946

AERONAUTICS

Maximum Speed for P-80 To Be Determined

➤ A SERIES of power dive tests by a remote-controlled Lockheed P-80 to be conducted in May or June will show Army Air Forces experts just how fast the plane can fly and give them information to be used in designing high-speed aircraft of the future.

Maj. Gen. B. W. Chidlaw, deputy commanding general, engineering, Air Materiel Command, said that a "mother" plane will guide the test craft on its dangerous mission.

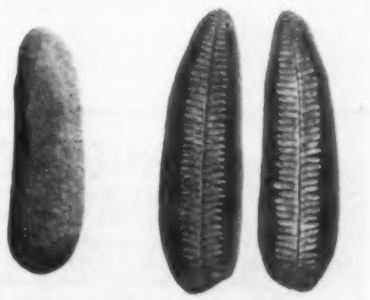
He reported that the planes for the test are now being fitted out at Bell Aircraft Corp., Niagara Falls, N. Y., and they are expected to be ready within two months.

A television camera in the test plane will give a constant picture of the control panel, while a ground control unit will direct landings and take-offs and inform the "mother" ship of the technical operation of the robot craft.

Tests are scheduled to begin with dives at an oblique angle and build up to a perpendicular dive from a high altitude.

Science News Letter, April 13, 1946

FOSSIL CONCRETIONS



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The concentration of *calcium* in the blood of laying hens is normally about twice that found in the blood of roosters.

No *whale oil* is used in the United States in making margarine, although large quantities are used for this purpose in certain other countries.

There are many types of *mahogany wood*, but mahogany from Cuba and Santo Domingo is preferred in fine furniture making because of its close grain, silky texture and beautiful color.

Roasted eggs may soon be on the market; in roasting they are whirled briefly at 235 degrees Fahrenheit, which centers the yolk, and the cooked egg will keep for months at ordinary temperatures.

Tantalum, which has some of the physical characteristics of steel and the chemical characteristics of glass, is used by bone surgeons; when implanted in the body, there is an almost complete absence of fibrous tissue reaction to it.

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GENERAL SCIENCE

Science at Parting of Ways

For future progress it must have peace, freedom from outside control, recruitment of young workers, National Academy President declares.

► SCIENCE, like all the civilization of which it is a part, is now at the parting of the ways, Dr. Frank B. Jewett, president of the National Academy of Sciences, indicated in a lecture before the Yale chapter of Sigma Xi, national research honor society. If it is to fulfill its great prewar promise it must have a long period of peace, freedom from military or other outside control, and the renewed and continual training of considerable numbers of young research workers.

The war practically stopped fundamental scientific research in this country, Dr. Jewett told his audience. Men who had been doing this kind of work were diverted into the war-spurred search for immediate military and industrial applications of the great body of facts that constituted our intellectual stockpile. They accomplished great and necessary things—but no additions were made to the stockpile.

These men, our basic research corps, are now returning to their regular tasks. There have been no really severe losses from their number, but they are all four or five years older. And behind them there is a lost generation of research students—the several thousands of exceptionally talented young people who should have been in the universities and other graduate training schools during the past five years but who have been in the armed services or in civilian war work instead. Those thousands of lost man-years of scientific work can never be made up; the best we can do now is to avoid any further loss of time as far as possible and get the young men back into research training as fast as they are demobilized.

Wartime work on application of research results gained in prewar years accomplished marvels under rather strict military controls, but such controls will never do for normal scientific work, the speaker emphatically declared.

"No matter what plausible arguments are advanced, fundamental science cannot flourish in peacetime under the regimentation of a wartime setup," he told his listeners. "Fundamental science can be aided—it cannot be directed. Its fruits are those of the free mind and no one is wise enough to know what another man's brain cells may produce if afforded opportunity to function freely."

Support for future research, Dr. Jewett said, divides itself into two phases. Applied or industrial research will not have a particularly difficult time in getting all the backing it needs. Big corporations have their own research staffs; smaller concerns have access to the facilities of such special establishments as the Mellon or Battelle Institutes.

"In the field of fundamental science," he continued, "the picture is not quite so clear. There has been much talk that in the future much of the work that has been done in educational institutions will be taken over by institutes devoted exclusively to research. . . . I have a strong feeling, however, that the great bulk of the contributions will continue to come from educational institutions where research and teaching are combined."

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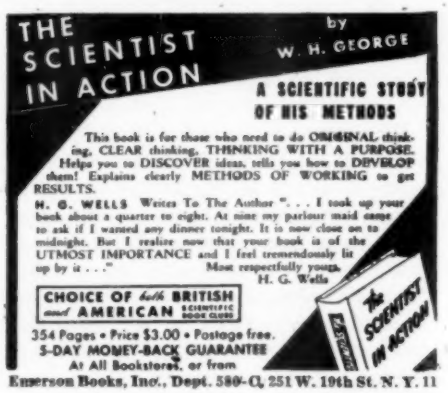
All-aluminum ships are planned in Norway and may soon be under construction; the country has an abundance of electric power to produce aluminum locally and to use in welding the metal plates in the shipyards.

Among new fibers for cloth are *Ardil*, made from peanut protein; *Soylon*, a soybean base material; *elastic nylon* with long-range rubber-like elasticity; and *resin fiber* exceptionally resistant to chemical and biological deterioration.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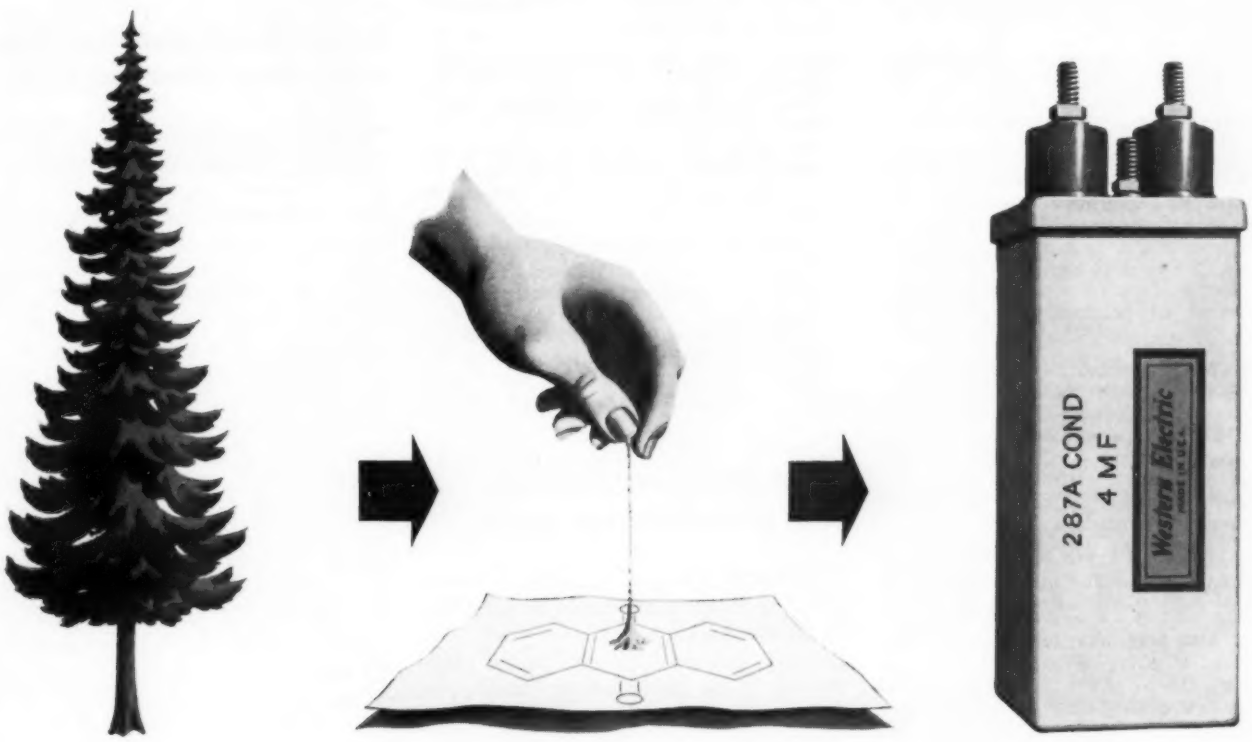
LIFE-EXTENSION BY THE GRAM



CRUCIAL links in every wire and radio system are paper capacitors — rolls of impregnated paper and metal foil. At least one is in every telephone — and more than 100 million are in the Bell System. A single failure can sever a telephone call, put a costly line out of service. So finding out how to make capacitors stand up longer is one of the big jobs of Bell Telephone Laboratories.

All-linen paper was once the pre-eminent material. Then wood pulp was tried — and found to last longer under heat and direct voltage. But why? Something in the wood was helping to preserve life. What was it?

Ultra-violet light, delicate micro-chemical analysis and hundreds of electrical tests gave a clue. Researchers followed it up—found the answer by treating the impregnated paper with anthraquinone — a dye intermediate. A mere pinch of the stuff prolongs capacitor life by many precious years.

When war came, great quantities of capacitors were urgently needed for military equipment, where failures could cost lives, lose battles. The Western Electric Company, manufacturing for the Bell System, willingly disclosed the life-preserving treatment to other manufacturers. Today in communication capacitors, the new "life-extension" is helping to give more dependable telephone service.

Day by day, resources of this great industrial laboratory are being applied to perfect the thousands of components which make up the Bell Telephone System.

BELL TELEPHONE LABORATORIES *EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE*

• Books of the Week •

AN INTRODUCTION TO POLYNESIAN ANTHROPOLIGY—Te Rangi Hiroa (Peter H. Buck)—*Bishop Museum,* 136 p., map, $1. Bernice P. Bishop Museum, Bulletin 187.

COLLOID CHEMISTRY: Theoretical and Applied, Vol. VI—Jerome Alexander, ed.—*Reinhold,* 1222 p., tables and illus., $20. General principles and specific industries; synthetic polymers and plastics. Papers by selected international contributors.

CRANIOMETRY OF AMBRY ISLAND—Wilfrid D. HAMBLY—*Chicago Natural Hist. Museum,* 158 p., maps., tables, illus., $2.75. Fieldiana: Anthropology, Vol. 37, No. 1.

HOW CHARACTER DEVELOPS: A Psychological Interpretation—Fritz Kunkel, M. D., and Roy E. Dickerson—*Scribner,* 287 p., $2.50. The first presentation in English of the psychological system of the senior author. The book is intended to give parents and teachers an insight into the development of personality during childhood.

MODERN MANAGEMENT IN CLINICAL MEDICINE—F. Kenneth Albrecht, M. D.—*Williams & Wilkins,* 1238 p., tables and illus., $10. A reference book for everyday practice, presenting for 21 different categories of diseases, a clear picture of the rationale of therapy together with useful and usable information.

THE NATURE OF PATENTABLE INVENTION: Its Attributes and Definition—John E. R. Hayes—*Addison-Wesley,* 183 p., $5.

SCIENCE AND SEIZURES: New Light on Epilepsy and Migraine—William G. Lennox—*Harper,* 258 p., tables and illus., $2; 2nd ed. A new edition of an important book, containing information on the new drug tridione.

THE SKELETAL ANATOMY OF FLEAS (SIPHONAPTERA)—R. E. Snodgrass—*Smithsonian Inst.,* 110 p., illus., 65 cents. Smithsonian Miscellaneous Collections, Vol. 104, No. 18.

TECHNIQUES OF GLASS MANIPULATION IN SCIENTIFIC RESEARCH—Julius D. Heldman—*Prentice Hall,* 144 p., diagrs. and illus., $3.60. Designed for the technician, the chemist, the biologist, the physicist, and all others who at some time find it desirable to repair breaks in glass apparatus or to fabricate not-too-complicated pieces of glass equipment.

TRAINING YOU TO TRAIN YOUR DOG—Blanche Saunders—*Doubleday,* 180 p., illus., $3. A scheme for training which offers something beyond the routine obedience tests, and is aimed at forming the dog's character; the book is based on the idea that it is the owner that needs training.

VALUES FOR SURVIVAL—Lewis Mumford—*Harcourt,* 314 p., $3. Essays, addresses, and letters on politics and education written during the period between 1938 and 1946, reviewing the struggle that lies behind and defining the even greater struggle that lies ahead.

Science News Letter, April 13, 1946

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ENGINEERING

Smokeless Coal Furnace Will Go on Market Soon

➤ SMOKELESS coal furnaces, a dream of inventors for more than a century, will be on the market within two years, J. R. Fellows, professor of mechanical engineering at the University of Illinois, predicted at the spring meeting of the American Society of Mechanical Engineers.

Prof. Fellows said that trial furnaces of the new type developed by the University of Illinois, and the Battelle Memorial Institute of Columbus, Ohio, are being used successfully, and manufacturers are now getting service experience before making the furnace generally available.

The Illinois hand-fired smokeless furnace uses a down-draft coking principle with fresh coal being slowly converted into coke in the coking chamber in the upper forward portion of the furnace. This coke is then burned in the coke-burning chamber in the lower rear part of the unit.

As the coal gases are released, they are drawn under the baffle and mixed with secondary air coming in through passages in the baffle wall. This gas-air mixture is ignited by the incandescent surface of the bed of burning coke.

Nearly 100 samples of coal from all parts of the country were tested at the University of Illinois with the conclusion that most varieties of bituminous coal can be burned smokelessly in the new furnace, Prof. Fellows said.

He said records for one of the furnaces installed in his home showed a 30% fuel saving, and tests on more than 100 trial installations indicate that the hand-fired smokeless furnace will duplicate the efficiency of conventional stoker-fired furnaces.

Science News Letter, April 13, 1946

METALLURGY

Balsa Wood and Aluminum Alloy Form New Material

➤ LAYERS of balsa wood between thin sheets of high-strength aluminum alloy, and all bonded together to form single light, rigid units, constitute a new construction material suitable for use in airplanes, prefabricated homes and for many other purposes. The new material, which will be known as Metalite, was announced by the Chance Vought Aircraft Division of the United Aircraft Corporation in Stratford, Conn.

In the new material, the grain direction of the balsa core is set perpendicular to the metal faces. The core material is relatively thick in comparison to the face plates. In its fabrication, a core material of greater density than balsa can be used in spots where greater strength is desired. The bonding is carried out under moderate heat and pressure. It can be done in a mold where single pieces of special shapes are desired.

In airplane construction, it has a particular advantage, the manufacturer claims, because whole panels can be fabricated with scarcely a single protuberance to interrupt the air flow, a difficulty which rivet heads present.

Metalite will be suitable for use in the construction of prefabricated houses, it is claimed, and for many other uses including household equipment, where its lightness and strength are an advantage.

Science News Letter, April 13, 1946

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ECOLOGY

NATURE RAMBLINGS
by Frank Thone

Death and Resurrection

➤ CHRISTENDOM, during the coming week, commemorates the age-old drama of the death and resurrection of its central figure. Even the least devout, perhaps unknowingly, make use of the traditional symbols of death and resurrection—the seemingly lifeless egg out of which comes new life, the rabbit that springs vigorously out of a hole that might have been taken for a grave, the flowers that emerge from apparently dead seeds and bulbs. Some of these symbols are older than the creed with which they have become associated; even the heathen could not bear the thought of death being the end, and sought cheer and hope in these vernal reassertions of life.

But there is a deeper and more widespread symbolism—as universal as death and life—that no religion, old or new, seems to take much account of. That is the endless cycle of death and resurrection that we see wherever things are growing. As summer approaches, we regret the death of the lovely early flowers; as autumn passes, we lament the fading and falling of the leaves. They lie in the common tomb of the earth, and decay has its way with them.

Yet if death and decay did not occur, there would soon be no more life on the earth. Growth would go on for a few seasons, but presently all the food-making (and hence life-making) elements in air and earth would have been extracted by the plants and locked up in their tissues. If they got no leave to die, the last generation of plants would have to stand forever, cursed with sterility, living but not growing because the last means of growth was already locked in their miser clutches. A world without death would be a world too monstrous to contemplate.

Because there is death in our normal world, and decay afterwards, life continues to be possible. Dead flowers and leaves, and dead tree trunks and animal bodies, all fulfill their destiny and return to the dust from whence they came. In doing so, they endow the very dust with the potentialities of life, for from the decay of dead things comes the humus that makes a soil fit for the support of living things. Into the earth blessed with the products of death we thrust our seed, and "look for the life that is to come."

Science News Letter, April 13, 1946

BACTERIOLOGY

Germs of Two Types Kill Japanese Beetles

➤ JAPANESE beetles can be killed by either of two different types of milky-disease germ, but not by both at the same time—if that's any consolation to a doomed beetle. This discovery was made by Dr. R. L. Beard, of the Connecticut Agricultural Experiment Station in New Haven, Conn. (*Science*, March 22)

In experimental inoculations, Dr. Beard found that if the germs of Type A and Type B of the milky disease are injected into the same beetle, a few days apart, the insect will eventually die of the type it receives first. If both kinds are injected simultaneously but in unequal quantities, death will be caused by the one given in the heavier dose. The two strains thus appear to be competitors.

One practical significance of this discovery might be that it is important to keep pure strains of milky-disease cultures when preparing to fight beetle infestation with this disease, as is widely done nowadays. If the two are mixed, their mutual antagonism might render the attack on the beetles less effective.

Dr. Beard states that it has not yet been learned whether these two strains have an antibiotic effect on each other, or whether some other mechanism is involved.

Science News Letter, April 13, 1946

ENGINEERING

Nazi Wind Tunnel Now At Ordnance Laboratory

➤ THE SUPERSONIC wind tunnel used by the Nazis in all their experiments leading to the development of the V-2 rocket bombs is now peacefully reposing at the U. S. Navy Ordnance Laboratory in Washington, D. C.

Originally part of the Germans' experimental station at Peenemunde, the tunnel was removed to Kochel, in Bavaria south of Munich, late in the war to protect it from Allied bomb attacks. It was discovered there by American troops late in the war.

Calling the tunnel "a rare prize," U. S. Navy experts say that it was used at the Peenemunde station for all the experimental work on V-2.

Included in the cache are models of shells, grenades and rockets that were tested for air pressures in the supersonic tunnel. Also captured were the Schlieren mirrors used to photograph the air flow about the supersonic projectiles.

The Nazis had a bank of 120 manometers for measuring pressures in the wind tunnel. Most unique feature of the captured wind tunnel is its large, quick-opening valve.

When the valve is opened, air passes through an opening 27½ inches in diameter. Opening this large passage in about one second is considered to be a remarkable achievement by the American scientists who have studied the captured equipment.

Installed at Peenemunde, the Germans had a 1,100 horsepower pump that allowed the 40-foot vacuum sphere to be evacuated in five minutes.

Science News Letter, April 13, 1946

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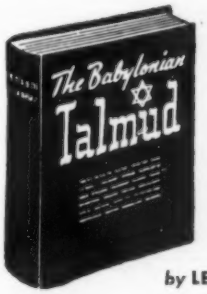

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·New Machines And Gadgets·

⚙ *DRINKING GLASS, recently patented, has an exterior coating of heat-insulating material that also strengthens the glass and makes it "sweat"-proof. The coating is a suitable flocking material blown onto the lower two-thirds of the glass and held by an adhesive.*

Science News Letter, April 13, 1946

⚙ *EMERGENCY TRUCKS for police departments carry in protective compartments every conceivable device needed in rescue work. These include floodlights powered with special generators, two-way radio, inhalators, rifles, fire axes, jacks, nets, poles, ladders, 1,000 feet of wire and certain electrical equipment.*

Science News Letter, April 13, 1946

⚙ *CARD TABLE TOP, recently patented, has holders for keeping the cards in an upright position in front of each player. The holder consists of four parallel slots in the table top into which the cards may be inserted. The slots vary in depth, with the deepest one to the front so that the rear cards can be seen over the others.*

Science News Letter, April 13, 1946

⚙ *BOAT SEAT UNIT, to eliminate jars and jolts in high-speed motor boats in rough or choppy waters, has two double-action hydraulic shock absorbers, two variable-rate coil springs and a torsion bar. The shock absorbers control the action of the springs; the torsion bar helps hold the seat on a given plane.*

Science News Letter, April 13, 1946

⚙ *ANTI-FOAM agent prevents oil in high-speed engines from bubbling and frothing due to air-mixture. The picture shows the effect when air is forced through treated and untreated oils. The agent, composition still secret, reduces surface tension on each individual bubble as formed, causing it to break quickly on reaching the surface.*

Science News Letter, April 13, 1946

⚙ *TANK TELESCOPE, adaptable to many civilian uses, can keep a target in focus as it magnifies from four to eight times. It uses a glass-without-sand optical system which renders a superior target image over a greater field-of-view, and true colors even at the extreme edges.*

Science News Letter, April 13, 1946

⚙ *ILLUMINATED COMPACT has a small dry battery and bulb that light up the face of the user when applying powder or other cosmetics. When the hinged cover of the compact with its inside mirror is opened, a switch is revealed by which the light is turned on.*

Science News Letter, April 13, 1946

⚙ *ELECTRIC HEATING pad has 30 heat controls that give the user a choice of 30 different temperatures. A handy light illuminates the temperature dial, and a newly developed rubberized casing permits the pad to be placed directly on a wet dressing.*

Science News Letter, April 13, 1946

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 306.

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